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IMPACT OF HEALTH CONDITIONS ON ABSENTEEISM FROM WORK

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Abstract

Every year many workers fail to turn up to work due to health problems or disability. The loss of working days affects negatively individuals' wellbeing, employers, and society in general. If on the one hand employers feel that they support most of the costs while workers are absent due to illness, on the other hand disabled employees face discrimination in labor market as employers believe that they are more likely to be absent from work. Using data from the 2005/2006 Portuguese National Health Survey, the goal of this work project is to investigate the role of health conditions on absence days reported by workers. The results, obtained from a probit model, confirm what has been found in economic literature for other countries. Disability has a positive impact on probability of absenteeism. However, in Portugal this effect is small; it amounts to a marginal increase of at most 1 day in a year.

Keywords: absenteeism, health problems and disability, Portugal

1. Introduction

There are over a billion people in the world living with some form of disability and almost everyone will experience some sort of disability at some point in life. The aging of the population, the higher risk of disability in older people and the global increase in chronic health conditions such as diabetes, cardiovascular disease, cancer and mental health disorders (WHO, 2011) have made disability a matter of an increasing concern. The concept of disability is very complex and has been subject of many discussions. The World Health Organization refers to it as "…the umbrella term for impairments, activity limitations and participation restrictions, referring to the negative aspects of the interaction between an individual (with a health condition) and that individual's contextual factors (environmental and personal factors) (19)." (WHO, 2011: p.4).

Disability brings with it economic and social costs such as cost of health care, loss of taxes, social protection, labor market programmes, and loss productivity (WHO, 2011). Concerning the loss of productivity, among other reasons, it is caused by absenteeism; some groups of workers with disability may be more absent from work due to their health status (type and severity of their disability). And because of that, they are often discriminated by employers.

The role and influence of health conditions on absenteeism from work have been subject of particular attention in recent years. However, so far, there is a lack of studies concerning the measurement of the impact of health condition on absenteeism. Sickness absence is undesirable for both employers and employees. And because it has important implications on production and labor policy discussions, it is important to fill the gap of economic literature in this area about Portuguese situation.

The aim of this study is to investigate the impact of individuals' health status on absenteeism from work; in this regard data from 2005/2006 Portuguese National Health Survey was used. As a starting point for the analysis, it was replicated the paper "The influence of disability on absenteeism: an empirical analysis with Spanish data", by Garcia-Serrano and Malo (2008). I find in this study, with a probit model, that disability has a positive but small impact on absenteeism. However, with a negative binomial model, which allows to address the number of days absent from work, I find that disabled workers are less absent from work. Thus, with these results, labor market discrimination against disabled workers cannot be traced back to economic effects or impact. Equal treatment should be granted even if equity issues are set aside.

Thus, this work project gives a contribution on the study of the role of health on work absences reported by workers in Portugal. It is divided in 6 sections, being the first this one, which will try to address this issue the best way. Section 2 presents a brief literature review on the determinants of sickness absence. The data and methodology are described in Section 3. Section 4 contains the descriptive statistics and Section 5 presents and discusses the results. Lastly, in Section 6 is presented the final remarks.

2. Literature Review

Disabled People and the Labor Market

People with disability face grater barriers in the labor market. They are often discriminated due to employers' ignorance about the type and severity of their disabilities and also because employers have concerns about their productivity and qualification (WHO, 2011).

Labor market theory suggests that the employment rate of people with disabilities is lower than the employment rate of people without disabilities. According to OECD (2010), their employment rate is, on average, 44%, almost half of the one for people without disability (75%). And the unemployment rate is almost 2.5 times higher, 49% for people with disability and 20% for the ones without disability. Among disabled people employment rates vary according to the type and severity of the disability.

Once employed, disabled workers face other barriers. They have much lower wages, around 15% lower than the national average (OECD, 2010). Among disabled employed workers there are differences, the incomes of disabled women are lower than the ones for disabled men. Another problem that some of them may face is the lack of access, e.g. they may not be able to bear the costs of travelling to and from work (WHO, 2011).

The Determinants of Sickness Absence

There are several studies on the determinants of sickness absence and from them it is possible to identify three major groups of determinants: individual personal characteristics, firm characteristics, and job characteristics.

Concerning individual personal characteristics sickness absence is associated with women, older individuals, and low skilled workers. According to Laaksonen M. et al (2010), women are more absent from work and a substantial part of this difference is justified by differences in occupation between men and women. Older people are also more likely to be absent once the risk of disability is higher at older ages (WHO, 2011). Hatletveit J. (2010) finds that on average employees with higher educational level have a significant lower probability of being absent and this may be related to wellbeing at work mainly through increased autonomy.

Turning to job and firm characteristics, those individuals working at public sector, larger firms, in elementary or unskilled occupations, and part-time workers are more likely to be absent from work (Black D. et al, 2011). According to Winkelmann R. (1999), those working in larger firms are predicted to have 1.8 more absent days than workers in smaller firms after wage effects are controlled for. Labriola M. et al (2006) find that sickness absence is associated with working with repetitive monotonous work, low skill discretion, low decision authority, and public employer.

Regarding the economic literature, there are limited numbers of studies on sickness absence from the workplace. Most of the studies relates the sickness absence with benefits and neglects its relation with health conditions (e.g. Ichino and Riphahn, 2004). An exception to that is the study by Bonato and Lusinyan (2004), it examines the determinants of sickness absence on a panel of 18 European countries during the period 1983–2003. Their results show that life expectancy (a proxy of good health) and low labor force participation are important determinants and they reduce sickness absence.

The study by Garcia-Serrano and Malo (2008) is another exception; the paper tries to fill the gap of economic literature in the study of the impact of health and disability on absenteeism reported by workers. They use data from the European Community Household Panel for Spain covering the period 1995-2001 to examine the impact of disability on absence from workplace, concluding that workers with disability are more absent from work and the total effect of disability on absenteeism amounts to a marginal increase of 6-10 days per year.

Concerning intervention measures within disability, a matter that is addressed briefly in this study, the World Report on Disability (WHO, 2011) tells us that people with disability may be more absent from work due to their condition, but they can perform

most of the jobs and with the right accommodations they can be productive and less absent. Thus, employers have the challenge to build a skilled workforce that include both people with and without disabilities, to adjust their environment to be able to welcome disabled workers, to create management programmes to receive new employees and to allow the return to work of workers that became disabled, and to prepare their staff towards the non-discriminations of these workers. Governments also face many challenges when it comes to improve the access of disabled people to labor market, e.g. laws and regulations, public programmes, and changing of attitudes.

3. Data and Methodology

Data

Since 1987 there has been carried out National Health Surveys (NHSs) at regular intervals. They are designed to provide information on health status and factors that determine it for population residing in Portugal.

This research uses data from the 2005/2006 Portuguese National Health Survey, the fourth health survey, which was developed in partnership by National Health Institute Dr. Ricardo Jorge (INSA) and Portuguese National Institute of Statistics. It is the first survey covering the entire Portuguese territory, continental and the autonomous regions of Azores and Madeira, and representing all residents in the country. This NHS addresses a number of aspects such as: socio-demographic background; general health information; temporary disability; chronic diseases; health care; consumption of medicines; expenses and income; consumption of tobacco; consumption of food and beverage; reproductive health and family planning; mental health.

As mentioned above, the first step is the replication of the study by Garcia-Serrano and Malo (2008). However, differently to that study where they use panel data to investigate the impact of disability on absenteeism, only a cross section sample is available.

The survey includes 15 457 households, representing a total of 41 303 individuals. From the initial sample, individuals under the age of 16 (minimum age for employment), people over the age of 65 (retirement age), unemployed people, and individuals who do not respond to questions that are important for the analysis were excluded.[2] Final sample is 719 observations. This population is representative of the eligible sample, there are no much differences and it can be seen in table A.1 from the annex.

Methodology

Although there are few studies correlating absenteeism with health status and disability, theoretical literature support the idea that disabled people may be more absent from work due to their health conditions.

In order to analyze the impact of disability on absenteeism from work, three main models were estimated:

$$Absenteeism/Absent\ Days = \alpha_1 Disability + \alpha_2 Disability * Bad\ Health + \alpha_3 Disability * Visits\ to\ Any\ Doctor + \alpha_4 Disability * Visits\ to\ Emergency\ Services\ or\ Maternity + \alpha_{5i}(Personal\ Characteristics) + \alpha_{6i}(Firm\ Characteristics) + \alpha_{7i}(Job\ Characteristics) + \alpha_7 Income$$

Where $\alpha_3 = 0$ and/or $\alpha_4 = 0$ define the several possibilities.

[2] A list of main questions that lead to reduction in the number of observations can be found in the annex.

The dependent variable *Absent Days* is a non-negative count variable (ranging from 0 to 14) while dependent variable *Absenteeism* is a dichotomous variable that takes value 0 when an individual do not report absence and 1 otherwise. They are constructed from the NHS based on individual response to the question "How many days were you absent from work (school)?" and it refers to the past two weeks.

Concerning the independent variables, *Disability* was built based on questions on chronic diseases. I consider as disabled individuals the ones that answered "yes" to one or more questions on chronic diseases, for example: "Do/Did you have diabetes?".[3]

This definition of disability does not correspond to WHO's definition which emphasizes the barriers that disability brings to someone's life and that hindering their full and effective participation in society on an equal basis with others (WHO, 2011). Thus, the number of disabled people in my sample is greater than it would be because it considers as disabled people individuals whose chronic diseases are not severe enough to hinder their day to day lives. It also reduces the comparability with Garcia-Serrano and Malo (2008) study once their selection criterion for disabled people is more restrictive.

The independent variables *Visits to Any Doctor and Visits to Emergency Services or Maternity* are control variables for health status and will be used in interaction with *Disability*. They are generated from individuals' answers to the following questions: "In the past three months, how many times did you visit a doctor?" and "Which doctor did you visit?" and "Where was the appointment?", respectively.

The survey has a question that assesses the individuals' general perception of their physical and psychological health. The response to the question "How do you perceive

[3] Full list of conditions in annex.

your health in general?" ranged from 1 (very good) to 5 (very bad) and is used as a measure of subjective health status. Self-rated health is one of the most simple and widely used measures of perceived health. There are evidences that it is an important predictor of future disability and health problems. So, it is reasonable to believe that there is an association between poor subjective health and disability i.e. that the predictors of subjective health and disability are likely to be similar. The variable *Bad Health* can help characterize the information given by the disability measure. And for the econometric analysis, it is dichotomized, taking value 1 if the individual answered bad or very bad and value 0 otherwise.

Regarding the other independent variables, the first group concerns *Personal Characteristics* and includes individuals' age, gender, marital status, educational level attained, and immigration status and years of residence. The variables on migration were generated based on a Human Development Research Paper by Barros et al (2009). There were considered eight variables that correspond to eight different groups of immigrants (based on country of origin) and one variable that corresponds to the number of years individuals reside in Portugal. Individuals from Brazil, other Latin American and Caribbean country, and Other Countries (individuals not included in other categories) were excluded from the estimations because they were not enough to allow the identification of the effect.

The second group refers to the *Firm Characteristics* and includes the type of institutional sector (a public or a private firm) and the type of industry. The variables on the type of industry were built based on the International Standard Industrial Classification of All Economic Activities (Rev.3.1) by UN. Individuals working in industries such as Mining and Quarrying, Fishing, Electricity, Gas and Water Supply,

Extraterritorial Organizations and Bodies, and Armed Force were excluded from the estimations since they were not enough to allow the identification of the effect. Agriculture industry was also excluded from the estimation due to its strong correlation (0.85) with variable Skilled Agricultural and Fishery Workers (occupation).

The third group presents the *Job Characteristics* and covers the type of occupation, job category (if an individual is self-employed or not), and the working hours. The variables on type of occupation were built on the basis of International Standard Classification of Occupations (ISCO-88) by International Labor Organization. An additional variable, income, was included in the analysis. Income was built on the basis of OECD equivalence scales; It was used the square root scale which divides household income by the square root of household size. Since in the NHS the monthly household income was divided into ten classes, a small transformation was performed so to use that information. It was considered for the calculations the midpoint of each class and once the last class had not a maximum point, 3500€ was considered its midpoint.[4]

The three models aim to provide a better understanding of the contribution of disability on the probability of absenteeism/number of absent days from work. The models, besides the variable disability and control variables for personal, job, and firm characteristics, have control variables for health status that are included in the estimations in interaction with the disability measure. The reason for including these

[4] I also tried to include another variable, years of schooling, but due to its strong correlation with educational levels (University and Primary or no studies) it was excluded from in the econometric analysis.

variables is that sickness episodes can happen to everybody. Since not all disabled workers visited a doctor, or visited an emergency service or maternity or considered their health status as bad or very bad, not all non-disabled workers did not visit a doctor, or visit an emergency service/maternity or considered their health status as good or very good. It is also important to call attention to the fact that these variables only appear in interaction with disability. This is because the effects of each variable alone are included in the vector of personal characteristics, and then excluded from the estimations due to lack of contribution of explanatory power.

As said before, the dependent variable, absenteeism, is a dichotomous variable that takes value 0 when an individual do not report absence and 1 otherwise and absent days is a non-negative count variable (ranging from 0 to 14). Therefore, in the econometric procedure I use a *Probit Model* and a *Negative Binomial Model* to estimate the impact of disability on probability of absenteeism and on the number of absence days respectively.

The coefficients from the probit model indicate the sign of the impact of disability and other explanatory variables on absenteeism. But they cannot be mistaken as the real impact of each explanatory variable on probability of absenteeism. Thus, it will be presented the marginal effects which provide more interesting information.

The Negative Binomial Model is also used since its results allow knowing the average days of absence for each group of individuals.

4. Descriptive Statistics

Table 1 presents the descriptive statistics of some of the variables used in the empirical analysis (table A.2 from the annex contains the descriptive statistics for all variables). It provides information on means and standard deviations for two groups of workers, the

ones with and without disability. The individuals were splitted into these groups to avoid possible correlations between absenteeism and other variables.

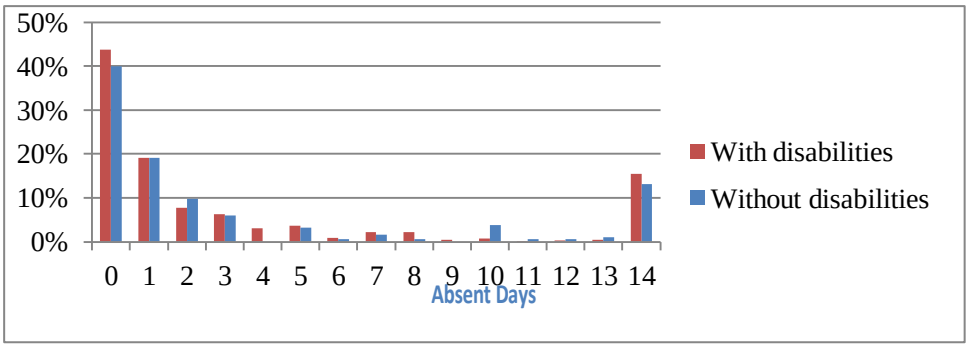
From the table we can see that, contrarily to what one might expect, the mean of absent days for people with and without disabilities is more or less the same (about 3.5 days). Compared to the Spanish case where the means are 3.41 and 5.34 (absence days per month) for non-disabled and disabled people respectively, these numbers are large. This is mostly justified by the fact that our time frame is quite short, so there is a considerable number of individuals that answered 14 (days absent), pulling up the means. However, if we exclude those individuals, the number of absent days is much closer to the Spanish one (see table A.3 from the annex).

Table 1. Descriptive Statistics. Portuguese NHS 2005/2006.

Variable	**People without disabilities**		**People with disabilities**	
	Mean	**St. Dev.**	**Mean**	**St. Dev.**
Absence days in two weeks	3,4098	4,9626	3,6073	5,0034
Bad health (1=Bad and Very Bad)	0,0328	0,1786	0,2876	0,4530
Number of visits to any doctor (past 3 months)	1,6339	1,7264	2,5679	2,3842
Numbers of visits to emergency services or maternity	0,2459	0,6951	0,1854	0,7526
Age: 16-24	0,1311	0,3385	0,0423	0,2015
Age: 25-34	0,3060	0,4621	0,1533	0,3605
Age: 35-44	0,3279	0,4707	0,2526	0,4348
Age: 45-54	0,1585	0,3662	0,2861	0,4523
Age: 55-65	0,0765	0,2665	0,2657	0,4420
Gender	0,5082	0,5013	0,6599	0,4741
Civil status	0,6120	0,4886	0,7212	0,4488
Educational level: Primary or no studies	0,6120	0,4886	0,7431	0,4373
Educational level: Secondary or Post secondary	0,2240	0,4181	0,1358	0,3428
Educational level: University	0,1639	0,3712	0,1212	0,3266
N	183		685	

Graphic 1 presents the distribution of absenteeism by disability status and it can be seen that there are not much differences between the two groups.

Graphic 1. Distribution of absenteeism by disability status. Portuguese NHS 2005/2006.



The responses are concentrated in zero, one, and fourteen days, over half of the individuals responded zero or one in both groups. Over 10% of individuals on both groups were absent fourteen days; as said above this is due to the fact that responses are confined to two weeks recall time. Thereby the data is somewhat skewed.

So far, there is no evidence that disability is related with absenteeism. Disabled people differ in type and severity of their disability and this may be one of the reason why there are not much differences between the two groups (disabled and non-disabled people), in my sample, concerning absenteeism.

Back to Table 1, as expected, people with disability went to a doctor more times (3 times) than people without disability (2 times) in past 3 months. The correlation between absent days and visits to any doctor is positive and statistically significant, but not strong (0.2). Regarding subjective health status, 30% of disabled people reported bad or very bad health status, while only 3% of people without disability reported bad or very bad health status. This result was expected since it is reasonable to believe that there is an association between disability and poor health status. The empirical analysis includes a proxy of objective health status that is the numbers of visits to emergency services or maternity, the objective of this variable is to capture the bad health periods. However, the results are a bit different from the expected; the mean of the visits is zero for both groups. From the table we can also see that individuals with disabilities have

lower educational level, 74% of them have primary or no studies; and have lower wages, 7% lower than the wages of non-disabled people.

Finally, one can notice that the number of disabled individuals is larger than the number of non-disabled individuals. This is due to the broad definition of disability that is applied in this study.

5. Discussion of Results

In order to have better estimates of the impact of disability on absenteeism/days absent, people that reported 14 days of absence were excluded from the estimations. Table 2 presents the results of the three models. It reports the marginal effects of disability variable and the interactions of disability with subjective health status, visits to any doctor, and visits to the emergency or maternity on absenteeism. Besides these variables, the models also include controls for individual, job, and firm characteristics, and an additional variable on income. A summary of marginal effects[5] and regression coefficients for model 1 are reported in table 4 (version 3).

Table 2. Average marginal effects of disability variables on probability of absenteeism estimated from Probit models. Portuguese NHS 2005/2006.

	Disability	**Bad Health*Disability**	**Visits to any doctor*Disability**	**Visits to the emergency*Disability**
Modelo 1	0,030	0,030		
Modelo 2	0,007	0,011	0,012	
Modelo 3	0,023	0,030		0,043

Considering the literature review, in all different specifications, disability presents the expected signs. Although not statistically significant and small, disability coefficients are positive which indicates that disabled workers have higher probability of being

[5] The calculation of the marginal effects for nonlinear models is not trivial, it cannot be applied the method used in linear models leading to many ways of calculating them (see Norton, 2004).

absent from work. The effect of disability on absenteeism amounts to a marginal increase of at most 1[6] day in a year. These results may be reflecting the fact that disabled people are different in type and severity of their disabilities and some people are included in the disabled group when their disabilities do not affect their day to day lives. Regarding the interaction of disability with other variables, which are aimed to catch health problems, they also have the expected impact. One can notice that the interaction of disability with bad health has the same or higher impact on probability of absenteeism than disability. Workers who report bad or very bad health status have at most 3% higher probability of being absent from work in two weeks. This is reflecting what was said, that self-rated health is an important predictor of disability and health problems. Although the estimate result is very small and not statistically significant, the coefficient of the interactions of disability with visits to any doctor has the expected sign. Workers with a disability that visit a doctor have 1% higher probability of absenteeism. The small impact may be justified by the fact that in the data used there is not a big difference in the number of visits to a doctor between disabled and non-disabled people. A stronger impact can be seen when looking at the interaction of disability with visits to emergency services or maternity. Disabled workers that visit emergency services or maternity are 1 day per year more absent than non-disabled ones. The predicted probabilities of absenteeism for both groups of workers are presented in table 3 for a better understanding of the joint effect of disability for people with and without disability. It displays the means, standard deviations, minima and maxima for the three probit models.

[6] 0,03*23 working weeks per year = 0,7 ≈ 1day in a year

The predicted probabilities were obtained by computing the average marginal effects after probit. When using average marginal effect, a marginal effect is computed for each individual, and then all the computed effects are averaged. Hence, the marginal effects for absenteeism (a categorical variable) show how P (absenteeism=1) changes as disability (also a categorical variable) changes from 0 to 1 holding all other variables equals, i.e.:

$$M.E.Disability = \Pr(Absent. = 1|X, Disab. = 1) - Pr(Absent. = 1|X, Disab. = 0)$$

Table 3. Predicted average effect of disability on probability of absenteeism

		Mean	Std. Dev.	Min	Max
Modelo 1	With disability	0,0372	0,1261	0,0165	0,0617
	W/O disability	0,0307	0,0056	0,0200	0,0615
Modelo 2	With disability	0,0370	0,0285	0,0060	0,2613
	W/O disability	0,0234	0,0165	0,0043	0,1173
Modelo 3	With disability	0,0379	0,0328	0,0124	0,2967
	W/O disability	0,0333	0,0259	0,0154	0,1740

From the table, one can see that there are no much differences in results between people with and without disabilities and between the three models. We predict that both groups of individuals increase their probability of being absent when going from a situation of non-disability to a disability situation. Although positive, it is important to point out that the impact of disability on probability of absenteeism is lower than we would expect (3% increase for non-disabled people and 4% increase for disabled people).

These results are compatible with the ones presented in Table 1, where both type of workers reported more or less the same mean of absent days (about 3,5 days). There are also no differences in results when the interactions are not considered; the predicted average effect of disability for both groups is still small. Thus, these results are telling a

different story when comparing to the ones in Garcia-Serrano and Malo (2008), where disability has a marginal impact on absenteeism of 6-10 days.

Table 4 below shows the estimated results for 3 versions of model 1 so one can see the changes of the variables on personal, job, and firm characteristics, and on migration and income (full estimates are presented in table A.4 from the annex). Concerning individuals' age, it can be seen that there is a positive correlation between age and absenteeism (as suggested by the literature); although this relationship is not clear since people from the range 35-44 has the lowest coefficient. What one can conclude is that the 35-44 years old people have the lowest absence rate. Women and married workers display lower levels of absenteeism. There is a negative correlation between education and absenteeism, workers with higher educational level report lower absence rate. Lastly, people born in PALOPs, other African countries (different from PALOPs), Eastern Europe countries, and another EU15 country (except for version 2) exhibit lower levels of absenteeism while emigrants exhibit higher levels. And the longer the residence years the lower is the absence rate. Regarding job and firm characteristics, important determinants of absenteeism, there is a negative correlation between private institutional sector and absenteeism. As expected, those working in private sector are less absent than those working in public sector, however, the impact almost zero. Those who are self-employed are 1 day less absent per year. Confirming the literature review, the variable working hours has a negative impact on absenteeism meaning that people who work more hours are less absent than people who work fewer hours. One possible explanation is that those who work more hours are also the ones with more temporal and location flexibility of work. All results are obtained after controlling for occupation and industry.

Table 4. Estimate results of probit model on absenteeism (0-13 absent days). Portuguese 2005/2006 NHS.

	Version 1				Version 2				Version 3			
Variable	**Coef.**	**Std. Err.**	**dy/dx**	**Std. Err.**	**Coef.**	**Std. Err.**	**dy/dx**	**Std. Err.**	**Coef.**	**Std. Err.**	**dy/dx**	**Std. Err.**
Disability (1=Yes)	0,0128	0,1150	0,0047	0,0426	0,0431	0,1163	0,0158	0,0427	0,0465	0,1192	0,0169	0,0433
Interaction: Health state*Disabilities (1=Bad health and disability)	0,2740	0,1159**	0,1015	0,0425**	0,2439	0,1184**	0,0896	0,0432**	0,2528	0,1197**	0,0919	0,0432**
Age: 16-24	0,4076	0,2190***	0,1511	0,08067***	0,3438	0,2274	0,1263	0,0832	0,3094	0,2320	0,1125	0,0840
Age: 25-34	0,3305	0,1463**	0,1225	0,0537**	0,3050	0,1545**	0,1120	0,0564**	0,2952	0,1585**	0,1073	0,0572***
Age: 35-44	0,1607	0,1295	0,0596	0,0479	0,1364	0,1366	0,0501	0,0501	0,1145	0,1383	0,0416	0,0502
Age: 45-54	0,3891	0,1281*	0,1442	0,0467*	0,3963	0,1321*	0,1455	0,0478*	0,3686	0,1337*	0,1340	0,0479*
Gender (1=Female)	-0,1101	0,0929	-0,0408	0,0343	-0,1351	0,1033	-0,0496	0,0378	-0,1651	0,1106	-0,0600	0,0400
Civil status (1=Married)	-0,0206	0,1019	-0,0076	0,0378	-0,0133	0,1035	-0,0049	0,0380	-0,0269	0,1051	-0,0098	0,0382
Educational level: Secondary or Post secondary	-0,2174	0,1268***	-0,0806	0,0467***	-0,1189	0,1467	-0,0437	0,0538	-0,1393	0,1506	-0,0506	0,0546
Educational level: University	-0,2804	0,1326**	-0,1039	0,0487**	-0,1363	0,1957	-0,0501	0,0718	-0,1962	0,2064	-0,0713	0,0749
PALOPs (birth)	-0,2396	0,2426	-0,0888	0,0897	-0,2320	0,2457	-0,0852	0,0901	-0,2207	0,2510	-0,0802	0,0911
Other African (birth)	-0,7849	0,7406	-0,2909	0,2739	-0,8364	0,7421	-0,3071	0,2720	-0,8578	0,7499	-0,3117	0,2719
Eastern Europe (birth)	-0,1740	0,6060	-0,0645	0,2245	-0,3189	0,6137	-0,1171	0,2253	-0,2514	0,6310	-0,0913	0,2292
EU15 (birth)	0,2740	0,3759	0,1015	0,1391	0,3483	0,3783	0,1279	0,1387	0,2751	0,3827	0,1000	0,1390
Emigrant	-0,0039	0,1398	-0,0014	0,0518	0,0184	0,1427	0,0067	0,0524	0,0226	0,1442	0,0082	0,0524
Years Residence (≤10)	-0,0072	0,0643	-0,0027	0,0238	0,0004	0,0654	0,0002	0,0240	0,0000	0,0673	-0,0003	0,0245

*,**,*** statistically significant at 1%, 5%, and 10% level respectively

The estimations for the Negative Binomial model are presented below. From this model we can have the impact of each variable on the number of absent days and also the predicted number of absent days for each group. Table 5 presents the coefficients of the marginal effects of the main variables on the number of absent days for the three different specifications. The average marginal effects are generated on the same basis as the ones for the probit model.

Table 5. Average marginal effects of disability variables on number of absence days estimated from Negative Binomial models. Portuguese NHS 2005/2006.

	Disability	**Bad Health*Disability**	**Visits to any doctor*Disability**	**Visits to the emergency*Disability**
Modelo 1	-0,288	0,049		
Modelo 2	-0,4912	-0,1208	0,0995	
Modelo 3	-0,347	0,0413		0,2497

Differently to the expected, given the above results, disability has a negative impact on absent days. All disability coefficients are negative, but not statistically significant, which means that non-disabled individuals are more absent from work than disabled individuals. And the marginal effect amounts to 7-11 days less absent.

Concerning the interaction of disability with bad health, a part from model 2, it is positive and not statistically significant. This indicates that workers with disability that report bad or very bad health status would be 1 day, at most, more absent from work than other workers. Regarding the interactions with visits to any doctor and visits to emergency services or maternity, although the estimate results are not statistically significant, the coefficients have the expected signs. Workers with disabilities who visit the emergency services or maternity and those who visit a doctor are 6 and 2 days more absent in a year, respectively.

Table 6, below, presents the predicted number of absent days for both disabled and non-disabled people. The results were obtained from the average marginal effects computed after negative binomial. The marginal effects for absent days show how the number of absent days (a continuous variable) changes as disability (a categorical variable) changes from 0 to 1 holding all other variables equals, i.e.:

$$M.E.Absent\ Days = \mathrm{E}\ (AbsentDays|X, Disab. = 1) - E\ (AbsentDays|X, Disab. = 0)$$

Table 6. Predicted number of absent days.

		Mean	Std. Dev.	Min	Max
Modelo 1	With disability	-0,2957	0,1266	-0,7327	-0,0518
	W/O disability	-0,2701	0,1022	-0,6578	-0,0595
Modelo 2	With disability	-0,2869	0,2962	-1,3714	1,5808
	W/O disability	-0,3128	0,1837	-0,7812	0,5185
Modelo 3	With disability	-0,2789	0,3714	-0,8135	3,3479
	W/O disability	-0,2542	0,2259	-0,7682	1,2493

By looking at the table it becomes clear that non-disabled people are more absent from work than disabled people. If a person goes from a disability to a non-disability situation, he/she increases the number of absent days by 7 days in a year. However, if a person goes from a non-disability to a disability situation, he/she is 7 days less absent per year. This is different from the results we got from the descriptive statistics and probit models. One explanation for that are the ones who reported 10 days of absence which can be long-term absence, like the ones who reported 14 days but were excluded from the estimations to not excessively skew the results.

Considering, in the estimations, the ones who answered 14 days do not affect much the results, but if we knew the real number of absent days then maybe the results would be

quantitatively more important. That is, the absence of effects should be read as saying that in the short-term absence there is little difference between the two groups, since nothing can be said about long-term absenteeism.

Part of the estimations of the three versions of model 1 is presented below in table 7 (full estimations can be found in annex – table A. 5). Control variables were added to the models to allow the visualization of changes in coefficients and significance levels.

Confirming the results obtained in probit models, women report higher absenteeism in versions 2 and 3. In turn, people with higher educational level display lower number of absent days. People born in PALOPs and in other African countries (different from PALOPs) exhibit lower levels of absenteeism while people born in Eastern Europe countries exhibit higher levels. In versions 1 and 2 emigrants still exhibit higher absenteeism levels, confirming the results from probit. People with longer years of residence are 12 days (in a year) more absent from workplace which contradicts the result obtained with probit model where those people are less absent.

Considering job and firm characteristics, the impacts are the same from the ones obtained in probit model concerning private institutional and self employed people. However, it is important to point out that the effects are much stronger. People working at private institutions are 2 days less absent while self-employed people are 1 days less absent in two weeks. Although very small, the impact of working hours on absent days is negative in version 2, but in version 3 the impact is positive, contradicting what was said before. Income still has no impact on days absent.

Table 7. Estimate results of Negative Binomial model on absenteeism (0-13 absent days). Portuguese 2005/2006 NHS.

	Version 1				Version 2				Version 3			
Variable	**Coef.**	**Std. Err.**	**dy/dx**	**Std. Err.**	**Coef.**	**Std. Err.**	**dy/dx**	**Std. Err.**	**Coef.**	**Std. Err.**	**dy/dx**	**Std. Err.**
Disability (1=Yes)	-0,157	0,145	-0,560	0,520	-0,179	0,147	-0,640	0,529	-0,178	0,150	-0,640	0,540
Interaction: Health state*Disabilities (1=Bad health and disability)	0,447	0,139*	0,159	0,517*	0,477	0,140*	0,171	0,527*	0,527	0,142*	1,890	0,540*
Age: 16-24	-0,334	0,276	-0,119	0,990	-0,455	0,287	-0,163	0,104	-0,307	0,289	-1,101	1,040
Age: 25-34	0,114	0,182	0,405	0,648	0,016	0,189	0,057	0,676	0,062	0,192	0,224	0,690
Age: 35-44	-0,003	0,162	-0,010	0,578	-0,086	0,170	-0,309	0,609	-0,054	0,170	-0,194	0,610
Age: 45-54	0,234	0,155	0,833	0,558	0,178	0,159	0,638	0,571	0,204	0,159	0,731	0,573
Gender (1=Female)	-0,041	0,117	-0,145	0,418	0,013	0,130	0,045	0,464	-0,035	0,144	-0,125	0,516
Civil status (1=Married)	0,102	0,126	0,363	0,452	0,094	0,128	0,335	0,459	0,071	0,128	0,254	0,460
Educational level: Secondary or Post secondary	-0,197	0,158	-0,703	0,565	-0,206	0,178	-0,736	0,643	-0,230	0,185	-0,826	0,670
Educational level: University	-0,279	0,167***	-0,995	0,604***	-0,484	0,251***	-0,173	0,914***	-0,635	0,274**	-2,277	1,007**
PALOPs (birth)	-0,276	0,317	-0,983	1,132	-0,309	0,318	-0,110	0,114	-0,115	0,318	-0,412	0,114
Other African (birth)	-1,191	1,042	-0,424	0,373	-0,908	1,055	-0,325	0,378	-0,746	1,051	-2,672	3,770
Eastern Europe (birth)	0,949	0,794	0,338	0,284	0,826	0,797	0,296	0,286	0,924	0,791	3,311	2,846
EU15 (birth)	-0,058	0,438	-0,208	0,156	0,044	0,446	0,158	0,160	0,152	0,447	0,545	1,605
Emigrant	-0,061	0,173	-0,218	0,618	-0,021	0,174	-0,075	0,624	0,024	0,174	0,086	0,625
Years Residence (≤10)	0,135	0,090	0,481	0,324	0,128	0,091	0,457	0,326	0,141	0,091	0,505	0,328

Using Negative Binomial models I have also estimated the predicted number of absent days for those individuals, from both groups, who were absent. Results are presented below.

Table 8. Predicted number of absent days (for those who have absenteeism.)

		Mean	Std. Dev.	Min	Max
Modelo 1	With disability	-0,9283	0,3039	-2,0762	-0,3156
	W/O disability	-0,7785	0,2598	-1,5627	-0,3184
Modelo 2	With disability	-0,9186	0,3406	-2,0689	0,1473
	W/O disability	-0,7999	0,2520	-1,5338	-0,3553
Modelo 3	With disability	-0,9157	0,4059	-1,9381	1,3881
	W/O disability	-0,7633	0,3294	-1,6498	0,3596

While the predicted number of absent days for disabled individuals who were absent increases by 21 days in a year if they change to a non-disability situation. The predicted number of absent days for non-disabled ones decreases by 18 days per year if they change to a disability situation.

6. Final Remarks

Absenteeism from work is a terrible scourge in Europe. Portugal has one of the highest absence rates in Europe with serious socio-economic costs. A great part of this absenteeism is justified by workers health problems. Every year, sickness absence costs millions to the economy and society in general mainly in lost output. However, this issue has been overlooked in economic literature. Thus, the present work project intended to give a contribution on the study of the role of health on work absences reported by workers in Portugal.

Results from a probit model suggested that disabled workers in Portugal have higher probability of being absent from work. However, this effect of disability is small. The marginal increase of absent days is at most 1 day per year. Regarding results from a

negative binomial model, they suggested that non-disabled workers are 7-11 days more absent per year than disabled workers. Additionally, workers with disabilities who visit the emergency services or maternity are 6 days more absent in a year while disabled workers who visit a doctor are 2 days more absent.

The outcomes are different and do not allow me to fully support the suggested in literature about impact of health conditions on absenteeism and about disabled individuals in labor market. Those tells us that people with disability may be more absent from work due to their condition and suggest discrimination from the employers' side due to concerns about disabled workers' productivity and qualification.

Based on the results of this study, labor market discrimination against disabled workers cannot be traced back to economic effects or impact. Equal treatment should be granted even if equity issues are set aside. So, Governments still have to improve the access of disabled people to labor market through laws and regulations, public programmes, and changing of attitudes.

It would be interesting, in further research, to test a narrower definition of disability. I believe that if more information about people's health condition was available, I would have used a more confined definition of disability and results could have been different. With a more restricted criterion to select disabled people I would not have considered as disabled people individuals whose chronic diseases were not severe enough to hinder their day to day lives. And I would have fewer disabled workers in my sample. Finally, having more complete information about long-term absence is something to be explored in future researches.

Annex

Annex A

Tables

Table A.1

Descriptive Statistics (26477 obsevations). Portuguese NHS 2005/2006.

Variable	**People without disabilities**		**People with disabilities**	
	Mean	**St. Dev.**	**Mean**	**St. Dev.**
Age: 16-24	0,27486	0,44646	0,08833	0,28378
Age: 25-34	0,25210	0,43424	0,12238	0,32773
Age: 35-44	0,23287	0,42268	0,20309	0,40231
Age: 45-54	0,15851	0,36523	0,26876	0,44333
Age: 55-65	0,08166	0,27386	0,31744	0,46550
Gender	0,44384	0,49686	0,56166	0,49620
Civil status	0,50936	0,49993	0,69125	0,46199
Educational level: Primary or no studies	0,63155	0,48241	0,77466	0,41782
Educational level: Secondary or Post secondary	0,22523	0,41775	0,11907	0,32389
Educational level: University	0,14323	0,35032	0,10626	0,30819
N	11646		14831	

Table A.2

Descriptive Statistics (0-14 days absent). Portuguese NHS 2005/2006.

Variable	People without disabilities		People with disabilities	
	Mean	**St. Dev.**	**Mean**	**St. Dev.**
Absence days in two weeks	3,4098	4,9626	3,6073	5,0034
Bad health (1=Bad and Very Bad)	0,0328	0,1786	0,2876	0,4530
Number of visits to any doctor (past 3 months)	1,6339	1,7264	2,5679	2,3842
Numbers of visits to emergency services or maternity	0,2459	0,6951	0,1854	0,7526
Age: 16-24	0,1311	0,3385	0,0423	0,2015
Age: 25-34	0,3060	0,4621	0,1533	0,3605
Age: 35-44	0,3279	0,4707	0,2526	0,4348
Age: 45-54	0,1585	0,3662	0,2861	0,4523
Age: 55-65	0,0765	0,2665	0,2657	0,4420
Gender	0,5082	0,5013	0,6599	0,4741
Civil status	0,6120	0,4886	0,7212	0,4488
Educational level: Primary or no studies	0,6120	0,4886	0,7431	0,4373
Educational level: Secondary or Post secondary	0,2240	0,4181	0,1358	0,3428
Educational level: University	0,1639	0,3712	0,1212	0,3266
Armed Force	0,0055	0,0739	0,0000	0,0000
Legislators, Senior Officials and Managers	0,0164	0,1273	0,0672	0,2505
Professionals	0,0984	0,2986	0,0774	0,2674
Technicians and Associate Professionals	0,0601	0,2383	0,0380	0,1912
Office Clerks	0,1311	0,3385	0,1051	0,3069
Service Workers and Shop and Market Sales Workers	0,1858	0,3900	0,1679	0,3740
Skilled Agricultural and Fishery Workers	0,0820	0,2751	0,1504	0,3577
Craft and Related Trades Workers	0,2514	0,4350	0,1577	0,3647
Plant and Machine Operators and Assemblers	0,0383	0,1923	0,0438	0,2048
Elementary Occupations	0,1038	0,3059	0,1693	0,3753
Working hours (per week)	40,1257	8,0213	41,1985	14,6703
Self employed	0,1366	0,3444	0,2818	0,4502
Institutional sector (1=Private firm)	0,8087	0,3944	0,8088	0,3936
Income	1.081,9310	852,3350	1.012,1980	812,1658
Agriculture	0,0601	0,2383	0,1460	0,3533
Fishing	0,0109	0,1043	0,0058	0,0762
Mining and Quarrying	0,0055	0,0739	0,0015	0,0382
Manufacturing	0,0765	0,2665	0,1197	0,3249
Electricity, gas and water supply	0,0055	0,0739	0,0044	0,0661
Construction	0,1858	0,3900	0,0686	0,2530

Cont. Table A.2

Variable	People without disabilities		People with disabilities	
	Mean	**St. Dev.**	**Mean**	**St. Dev.**
Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	0,1967	0,3986	0,1460	0,3533
Hotels and Restaurants	0,0765	0,2665	0,0788	0,2697
Transport, storage and communications	0,0328	0,1786	0,0248	0,1557
Financial intermediation	0,0000	0,0000	0,0263	0,1601
Real estate, renting and business activities	0,0328	0,1786	0,0219	0,1465
Public administration and defense; compulsory social security	0,0656	0,2482	0,0774	0,2674
Education	0,1093	0,3129	0,1080	0,3106
Health and social work	0,0601	0,2383	0,0526	0,2233
Other community, social and personal service activities	0,0437	0,2050	0,0584	0,2347
Activities of private households as employers and undifferentiated production activities of private households	0,0383	0,1923	0,0569	0,2319
Extraterritorial organizations and bodies	0,0000	0,0000	0,0015	0,0382
Portugal (birth)	0,8798	0,3261	0,9372	0,2427
PALOPs (birth)	0,0492	0,2168	0,0350	0,1840
Other African (birth)	0,0109	0,1043	0,0015	0,0382
Brazil (birth)	0,0109	0,1043	0,0000	0,0000
Other Lac (birth)	0,0109	0,1043	0,0000	0,0000
Eastern Europe (birth)	0,0164	0,1273	0,0058	0,0762
EU15 (birth)	0,0109	0,1043	0,0175	0,1313
Other Countries (birth)	0,0000	0,0000	0,0015	0,0382
Emigrant	0,0765	0,2665	0,1241	0,3299
Years Residence (≤10)	9,7924	1,0693	9,8964	0,8197
N	183		685	

Table A.3

Descriptive Statistics (0-13 absent days). Portuguese NHS 2005/2006.

Variable	People without disabilities		People with disabilities	
	Mean	**St. Dev.**	**Mean**	**St. Dev.**
Absence days in two weeks	1,8113	2,9600	1,7047	2,4882
Bad health (1=Bad and Very Bad)	0,0314	0,1751	0,2522	0,4346
Number of visits to any doctor (past 3 months)	1,4088	1,4374	2,3592	2,3424
Numbers of visits to emergency services or maternity	0,2516	0,7201	0,1934	0,7830
Age: 16-24	0,1447	0,3529	0,0484	0,2147
Age: 25-34	0,3019	0,4605	0,1589	0,3659
Age: 35-44	0,3333	0,4729	0,2504	0,4336
Age: 45-54	0,1384	0,3464	0,2763	0,4476
Age: 55-65	0,0818	0,2749	0,2660	0,4422
Gender	0,5346	0,5004	0,6684	0,4712
Civil status	0,6038	0,4907	0,7081	0,4550
Educational level: Primary or no studies	0,5849	0,4943	0,7409	0,4385
Educational level: Secondary or Post secondary	0,2390	0,4278	0,1364	0,3436
Educational level: University	0,1761	0,3821	0,1226	0,3283
Armed Force	0,0063	0,0793	0,0000	0,0000
Legislators, Senior Officials and Managers	0,0189	0,1365	0,0639	0,2448
Professionals	0,0943	0,2932	0,0794	0,2707
Technicians and Associate Professionals	0,0629	0,2435	0,0363	0,1871
Office Clerks	0,1384	0,3464	0,1088	0,3117
Service Workers and Shop and Market Sales Workers	0,2075	0,4068	0,1762	0,3813
Skilled Agricultural and Fishery Workers	0,0755	0,2650	0,1554	0,3626
Craft and Related Trades Workers	0,2264	0,4198	0,1537	0,3610
Plant and Machine Operators and Assemblers	0,0440	0,2058	0,0380	0,1914
Elementary Occupations	0,0943	0,2932	0,1693	0,3753
Working hours (per week)	39,8931	7,9401	41,1865	15,1018
Self employed	0,1447	0,3529	0,2902	0,4542
Institutional sector (1=Private firm)	0,8113	0,3925	0,8238	0,3813
Income	1.112,8610	869,3728	1.014,5980	834,3078
Agriculture	0,0566	0,2318	0,1485	0,3559
Fishing	0,0063	0,0793	0,0052	0,0719
Mining and Quarrying	0,0063	0,0793	0,0017	0,0416
Manufacturing	0,0629	0,2435	0,1140	0,3181
Electricity, gas and water supply	0,0063	0,0793	0,0035	0,0587
Construction	0,1572	0,3652	0,0674	0,2509

Cont. Table A.3

Variable	People without disabilities		People with disabilities	
	Mean	**St. Dev.**	**Mean**	**St. Dev.**
Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	0,2075	0,4068	0,1554	0,3626
Hotels and Restaurants	0,0881	0,2843	0,0829	0,2760
Transport, storage and communications	0,0377	0,1912	0,0225	0,1483
Financial intermediation	0,0000	0,0000	0,0259	0,1590
Real estate, renting and business activities	0,0377	0,1912	0,0242	0,1537
Public administration and defense; compulsory social security	0,0692	0,2546	0,0777	0,2680
Education	0,1132	0,3178	0,1002	0,3005
Health and social work	0,0629	0,2435	0,0518	0,2218
Other community, social and personal service activities	0,0440	0,2058	0,0553	0,2287
Activities of private households as employers and undifferentiated production activities of private households	0,0440	0,2058	0,0604	0,2385
Extraterritorial organizations and bodies	0,0000	0,0000	0,0017	0,0416
Portugal (birth)	0,8805	0,3254	0,9344	0,2478
PALOPs (birth)	0,0503	0,2193	0,0380	0,1914
Other African (birth)	0,0126	0,1118	0,0017	0,0416
Brazil (birth)	0,0063	0,0793	0,0000	0,0000
Other Lac (birth)	0,0126	0,1118	0,0000	0,0000
Eastern Europe (birth)	0,0126	0,1118	0,0069	0,0829
EU15 (birth)	0,0126	0,1118	0,0155	0,1238
Other Countries (birth)	0,0000	0,0000	0,0017	0,0416
Emigrant	0,0755	0,2650	0,1244	0,3303
Years Residence (≤10)	9,7925	1,0796	9,8774	0,8904
N	159		579	

Table A.4

Estimate results of probit model on absenteeism (0-13 absent days). Portuguese 2005/2006 NHS

	Version 1				Version 2				Version 3			
Variable	**Coef.**	**Std. Err.**	**dy/dx**	**Std. Err.**	**Coef.**	**Std. Err.**	**dy/dx**	**Std. Err.**	**Coef.**	**Std. Err.**	**dy/dx**	**Std. Err.**
Disability (1=Yes)	0,013	0,115	0,005	0,043	0,043	0,116	0,016	0,043	0,047	0,119	0,017	0,043
Interaction: Health state*Disabilities (1=Bad health and disability)	0,274	0,116**	0,102	0,043**	0,244	0,118**	0,090	0,043**	0,253	0,120**	0,092	0,043**
Age: 16-24	0,408	0,219***	0,151	0,081***	0,344	0,227	0,126	0,083	0,309	0,232	0,112	0,084
Age: 25-34	0,330	0,146**	0,122	0,054**	0,305	0,155**	0,112	0,056**	0,295	0,159**	0,107	0,057***
Age: 35-44	0,161	0,130	0,060	0,048	0,136	0,137	0,050	0,050	0,114	0,138	0,042	0,050
Age: 45-54	0,389	0,128*	0,144	0,047*	0,396	0,132*	0,146	0,048*	0,369	0,134*	0,134	0,048*
Gender (1=Female)	-0,110	0,093	-0,041	0,034	-0,135	0,103	-0,050	0,038	-0,165	0,111	-0,060	0,040
Civil status (1=Married)	-0,021	0,102	-0,008	0,038	-0,013	0,104	-0,005	0,038	-0,027	0,105	-0,010	0,038
Educational level: Secondary or Post secondary	-0,217	0,127***	-0,081	0,047***	-0,119	0,147	-0,044	0,054	-0,139	0,151	-0,051	0,055
Educational level: University	-0,280	0,133**	-0,104	0,049**	-0,136	0,196	-0,050	0,072	-0,196	0,206	-0,071	0,075
PALOPs (birth)	-0,240	0,243	-0,089	0,090	-0,232	0,246	-0,085	0,090	-0,221	0,251	-0,080	0,091
Other African (birth)	-0,785	0,741	-0,291	0,274	-0,836	0,742	-0,307	0,272	-0,858	0,750	-0,312	0,272
Eastern Europe (birth)	-0,174	0,606	-0,064	0,225	-0,319	0,614	-0,117	0,225	-0,251	0,631	-0,091	0,229
EU15 (birth)	0,274	0,376	0,102	0,139	0,348	0,378	0,128	0,139	0,275	0,383	0,100	0,139
Emigrant	-0,004	0,140	-0,001	0,052	0,018	0,143	0,007	0,052	0,023	0,144	0,008	0,052
Years Residence (≤10)	-0,007	0,064	-0,003	0,024	0,000	0,065	0,000	0,024	0,000	0,067	0,000	0,024
Professionals					-0,032	0,234	-0,012	0,086	-0,048	0,241	-0,017	0,088

Cont. Table A.4

	Version 1				Version 2				Version 3			
Variable	**Coef.**	**Std. Err.**	**dy/dx**	**Std. Err.**	**Coef.**	**Std. Err.**	**dy/dx**	**Std. Err.**	**Coef.**	**Std. Err.**	**dy/dx**	**Std. Err.**
Technicians and Associate Professionals					0,3794	0,3316	0,1398	0,1218	0,3376	0,3477	0,1228	0,1262
Office Clerks					0,4399	0,3069	0,1621	0,1125	0,5713	0,33***	0,2078	0,12***
Service Workers and Shop and Market Sales Workers					0,6864	0,29**	0,2529	0,11**	0,7102	0,30**	0,2583	0,11**
Skilled Agricultural and Fishery Workers					0,5193	0,30**	0,1913	0,11***	0,7101	0,42***	0,2583	0,15***
Craft and Related Trades Workers					0,6868	0,30**	0,2530	0,11***	0,6472	0,32**	0,2354	0,12**
Plant and Machine Operators and Assemblers					0,8114	0,40**	0,2989	0,15**	0,8916	0,42**	0,3243	0,15**
Elementary Occupations					0,5374	0,31***	0,1980	0,11***	0,6349	0,33**	0,2310	0,12**
Working hours (per week)					-0,0057	0,0049	-0,0021	0,0000	-0,0047	0,0051	-0,0017	0,0019
Self employed					-0,1176	0,1555	-0,0433	0,0572	-0,1358	0,1609	-0,0494	0,0584
Income					0,0001	0,0001	0,0000	0,0000	0,0001	0,0001	0,0000	0,0000
Institutional sector (1=Private firm)									-0,0004	0,2003	-0,0001	0,0729
Manufacturing									-0,0004	0,2003	0,0653	0,1342
Construction									0,3807	0,4068	0,1385	0,1477
Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods									0,3007	0,3486	0,1094	0,1265
Hotels and Restaurants									0,0127	0,3798	0,0046	0,1381
Transport, storage and communications									-0,4281	0,4869	-0,1557	0,1768

Cont. Table A.4

	Version 1				Version 2				Version 3			
Variable	**Coef.**	**Std. Err.**	**dy/dx**	**Std. Err.**	**Coef.**	**Std. Err.**	**dy/dx**	**Std. Err.**	**Coef.**	**Std. Err.**	**dy/dx**	**Std. Err.**
Financial intermediation									-0,1707	0,5035	-0,0621	0,1831
Real estate, renting and business activities									0,4722	0,4740	0,1718	0,1719
Public administration and defense; compulsory social security									0,3750	0,1086	0,0395	0,1364
Education									0,3835	0,3820	0,1395	0,1386
Health and social work									0,1110	0,4012	0,0404	0,1459
Other community, social and personal service activities									0,1459	0,3874	0,0531	0,1409
Activities of private households as employers and undifferentiated production activities of private households									-0,0075	0,3814	-0,0027	0,1387
Constant	1,5167	1,1946			1,0495	1,2769			0,7926	1,3626		

*,**,*** statistically significant at 1%, 5%, and 10% level respectively

Table A.5

Estimate results of Negative Binomial model on absenteeism (0-13 absent days). Portuguese 2005/2006 NHS

	Version 1				Version 2				Version 3			
Variable	**Coef.**	**Std. Err.**	**dy/dx**	**Std. Err.**	**Coef.**	**Std. Err.**	**dy/dx**	**Std. Err.**	**Coef.**	**Std. Err.**	**dy/dx**	**Std. Err.**
Disability (1=Yes)	-0,157	0,145	-0,560	0,520	-0,179	0,147	-0,640	0,529	-0,178	0,150	-0,640	0,540
Interaction: Health state*Disabilities (1=Bad health and disability)	0,447	0,139*	0,159	0,517*	0,477	0,140*	0,171	0,527*	0,527	0,142*	1,890	0,540*
Age: 16-24	-0,334	0,276	-0,119	0,990	-0,455	0,287	-0,163	0,104	-0,307	0,289	-1,101	1,040
Age: 25-34	0,114	0,182	0,405	0,648	0,016	0,189	0,057	0,676	0,062	0,192	0,224	0,690
Age: 35-44	-0,003	0,162	-0,010	0,578	-0,086	0,170	-0,309	0,609	-0,054	0,170	-0,194	0,610
Age: 45-54	0,234	0,155	0,833	0,558	0,178	0,159	0,638	0,571	0,204	0,159	0,731	0,573
Gender (1=Female)	-0,041	0,117	-0,145	0,418	0,013	0,130	0,045	0,464	-0,035	0,144	-0,125	0,516
Civil status (1=Married)	0,102	0,126	0,363	0,452	0,094	0,128	0,335	0,459	0,071	0,128	0,254	0,460
Educational level: Secondary or Post secondary	-0,197	0,158	-0,703	0,565	-0,206	0,178	-0,736	0,643	-0,230	0,185	-0,826	0,670
Educational level: University	-0,279	0,167***	-0,995	0,604***	-0,484	0,251***	-0,173	0,914***	-0,635	0,274**	-2,277	1,007**
PALOPs (birth)	-0,276	0,317	-0,983	1,132	-0,309	0,318	-0,110	0,114	-0,115	0,318	-0,412	0,114
Other African (birth)	-1,191	1,042	-0,424	0,373	-0,908	1,055	-0,325	0,378	-0,746	1,051	-2,672	3,770
Eastern Europe (birth)	0,949	0,794	0,338	0,284	0,826	0,797	0,296	0,286	0,924	0,791	3,311	2,846
EU15 (birth)	-0,058	0,438	-0,208	0,156	0,044	0,446	0,158	0,160	0,152	0,447	0,545	1,605
Emigrant	-0,061	0,173	-0,218	0,618	-0,021	0,174	-0,075	0,624	0,024	0,174	0,086	0,625
Years Residence (≤10)	0,135	0,090	0,481	0,324	0,128	0,091	0,457	0,326	0,141	0,091	0,505	0,328
Professionals					-0,143	0,292	-0,513	0,104	-0,266	0,301	-0,953	1,082

Cont. Table A.5

	Version 1				Version 2				Version 3			
Variable	**Coef.**	**Std. Err.**	**dy/dx**	**Std. Err.**	**Coef.**	**Std. Err.**	**dy/dx**	**Std. Err.**	**Coef.**	**Std. Err.**	**dy/dx**	**Std. Err.**
Technicians and Associate Professionals					-0,302	0,337	-0,108	0,121	-0,318	0,355	-1,138	1,275
Office Clerks					-0,470	0,276***	-0,168	0,100***	-0,552	0,302***	-1,977	1,097***
Service Workers and Shop and Market Sales Workers					-0,473	0,272***	-0,169	0,985***	-0,555	0,281**	-1,988	1,023**
Skilled Agricultural and Fishery Workers					-0,455	0,273***	-0,163	0,987***	-0,590	0,387	-2,114	1,401
Craft and Related Trades Workers					-0,204	0,269	-0,730	0,966	-0,363	0,296	-1,301	1,068
Plant and Machine Operators and Assemblers					-0,166	0,347	-0,595	0,124	-0,178	0,365	-0,637	1,311
Elementary Occupations					-0,318	0,283	-0,114	0,102	-0,316	0,295	-1,322	1,060
Working hours (per week)					-0,001	0,005***	-0,005	0,017***	0,001	0,005	0,002	0,017
Self employed					-0,276	0,167	-0,986	0,604	-0,209	0,168	-0,750	0,605
Income					0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Institutional sector (1=Private firm)									-0,515	0,229**	-1,845	0,840**
Manufacturing									0,082	0,381	0,292	1,367
Construction									0,038	0,399	0,136	1,430
Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods									-0,157	0,348	-0,563	1,247
Hotels and Restaurants									-0,310	0,378	-1,112	1,359
Transport, storage and communications									-0,217	0,487	-0,780	1,748

Cont. Table A.5

	Version 1				Version 2				Version 3			
Variable	**Coef.**	**Std. Err.**	**dy/dx**	**Std. Err.**	**Coef.**	**Std. Err.**	**dy/dx**	**Std. Err.**	**Coef.**	**Std. Err.**	**dy/dx**	**Std. Err.**
Financial intermediation									-0,30	0,62	-0,58	1,20
Real estate, renting and business activities									0,54	0,55	1,04	1,06
Public administration and defense; compulsory social security									0,39	0,45	0,76	0,88
Education									0,64	0,44	1,23	0,86
Health and social work									0,57	0,47	1,11	0,91
Other community, social and personal service activities									0,61	0,43	1,17	0,83
Activities of private households as employers and undifferentiated production activities of private households									-0,06	0,45	-0,11	0,86
Constant	0,77	1,06			0,46	1,16			0,32	1,25		
/lnalpha	0,40	0,09			0,37	0,10			0,33	0,10		
Alpha	1,49	0,14			1,45	0,14			1,40	0,14		

*,**,*** statistically significant at 1%, 5%, and 10% level respectively

Annex B

List of the main questions that lead to reduction in the number of observations

and

List of conditions to consider a person as disabled individual

List of main questions that lead to reduction in the number of observations

When excluding individuals under the age of 16 and over the age of 65, 14805 observations are deleted.

Regarding the question "How many days were you absent from work (school)?", 25 162 individuals did not respond and were excluded from the estimations.

Concerning the question "How do you perceive your health in general?", 366 individuals were excluded because they did not respond to the question.

List of conditions to consider a person as disabled individual

The variable Disability was built based on questions on chronic diseases. I consider as disabled individuals the ones that answered "yes" to one or more of the following questions:

Q 5.1 - Do/Did you have diabetes?

Q 5.10 - Do/Did you have asthma?

Q 5.16 - Do/Did you have high blood pressure?

Q 5.21 - Do/Did you have chronic pain?

Q 5.4 - Do/Did you have one or more of the following chronic diseases?

1. Rheumatic disease (osteoarthritis, tendinitis)
2. Osteoporosis
3. Glaucoma
4. Retinopathy (retinal disease)
5. Malignant tumor or Cancer
6. Kidney stone
7. Renal failure
8. Chronic anxiety
9. Chronic wound (leg ulcers, sores)
10. Emphysema (chronic obstructive pulmonary disease), chronic bronchitis
11. Stroke
12. Obesity
13. Depression
14. Myocardial infaction
15. Other (indicate)

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